

CHOOSING THE CORRECT LIMBERG FLAP

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If a lesion can be completely excised within a fusiform segment of skin, and if the ensuing defect can be closed by straight advancement of its skin borders, then that is the procedure of choice.¹ When the defect is too large to permit this simple, direct closure, then the local flap designed by Limberg² to close rhomboid defects could be used (unless the size of defect is such that a skin graft or a distant flap is necessary).

Designing a Limberg flap, however, can tax the ingenuity of even the most experienced plastic surgeon. Trial and error is not a satisfactory way. The purpose of this paper is to present a planning technique for a Limberg flap that does

not require great experience—yet will work.

DESIGN OF THE LIMBERG FLAP

The Limberg flap is designed for the closure of a 60° rhomboid defect, one which is an equilateral parallelogram with angles of 60° and 120° (Fig. 1). The flap outline is created by extending the *short* diagonal in either direction from the rhomboid by a distance equal to its own length (UV), and then incising a third side (VW) at an angle of 60° to the extended short diagonal; VW must be equal in length to UV , *etc.* (All sides of the defect and all sides of the flap are of equal length, while the opposing angles

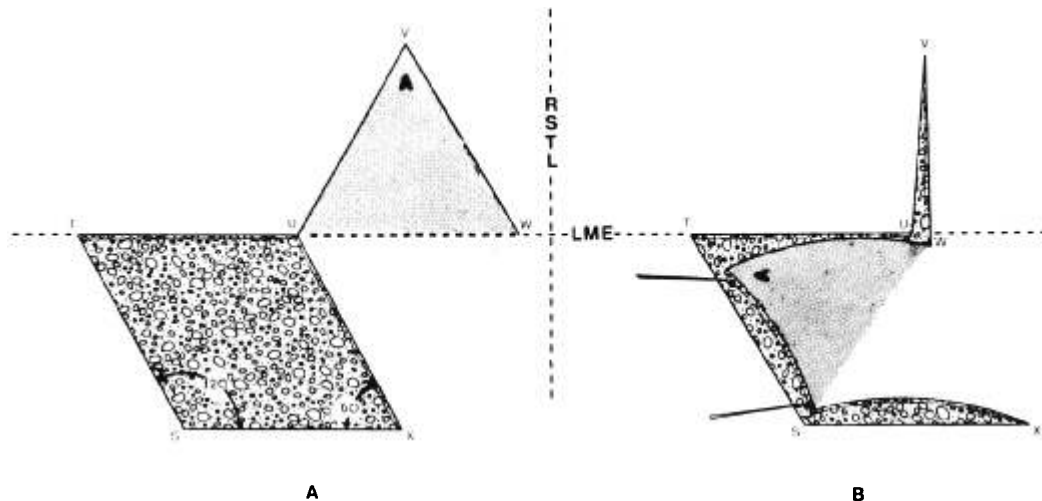


FIG. 1. (*left*) A Limberg flap designed for the closure of a 60° rhomboid skin defect. The short axis, the sides of the defect, and the sides of the flap are all of equal length. For greatest ease of closure, the line of maximum extensibility in the skin should be placed along the base (UW) of triangle UWV . (*right*) The flap has been transposed into the defect. Note that the greatest tension lies in the approximation of the donor area (point W to point U). The distal half of the rhomboid defect (STU) is closed by the transposition of the flap (UVW); the proximal half is a straight line closure of angle SXU .

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of each are either 60° or 120° .)

The crucial point in designing a Limberg flap is the correct placement of the direction of the base (UIV) of triangle UIW (Fig. 1) in relation to the line (axis) of maximum extensibility (LME). The latter is at a right angle to the relaxed skin tension line ($RSTL$).

Following the transfer of a Limberg flap the greatest tension in closing the triangular donor defect will be between the distal points of its base (IV to U). To accomplish this closure with the least ten-

sion, it is necessary to orient the design so that this secondary defect is closed in the same direction as the LME .³

Gibson,⁴ Gibson *et al.*,⁵ and Lister and Gibson,⁶ having researched the physical properties of skin, concluded that the direction of motion of the distal point (W) of the base of the flap should be along the line of maximum extensibility (LME).^{7,8} If we place the base of the triangle in that direction, the flap will be transposed and the defect will close with the greatest ease and least tension.

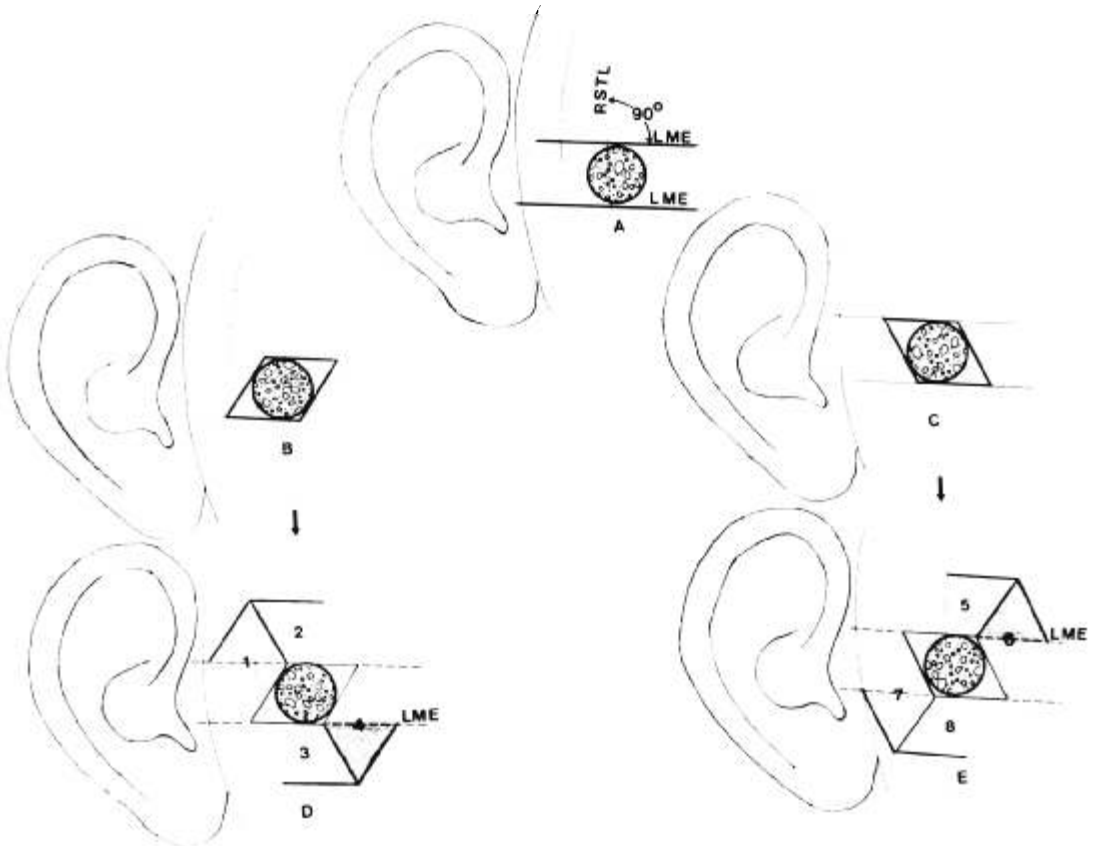


FIG. 2. Choosing the best Limberg flap on the basis of tissue availability and the position of the lesion to be excised. (A) Two parallel lines are drawn tangential to the defect and to axis LME . (B, C) The sides of the parallelograms tilting medially and laterally are added. (D, E) Four possible Limberg flaps are drawn for each rhomboid defect. The bases of the triangles in flaps 2, 3, 5, and 8 do not follow the LME . Flaps 1 and 7 are difficult to transfer because their pedicles are attached to unyielding ear skin. Either flap 4 or flap 6 is the correct Limberg flap to use.

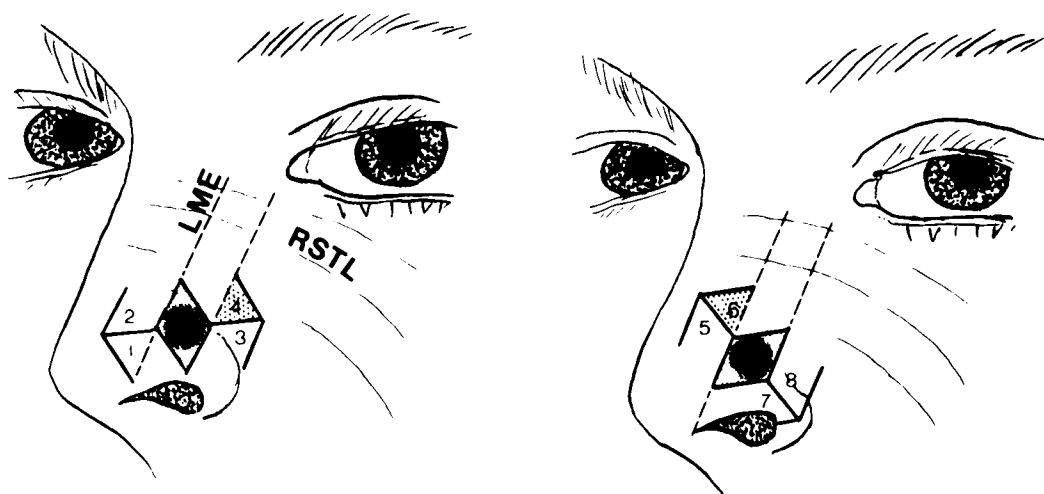


FIG. 3. A skin defect close to the margin of nose. Only flaps 4 or 6 are correct ones to use.

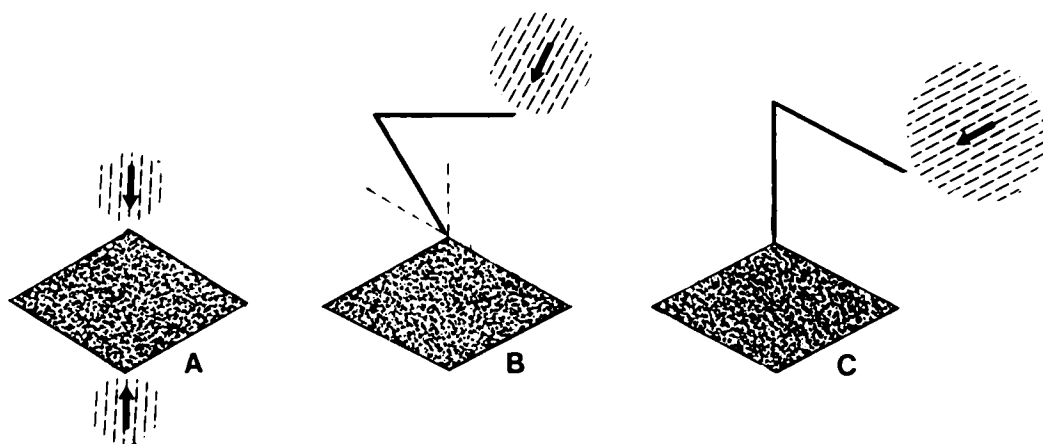


FIG. 4. (A) In closing a rhomboid defect by straight advancement, the skin is pulled in a line with the short axis of the defect (from top to bottom and *vice versa*). (B) In the Dufourmentel flap the pull is slightly more inclined. (C) In the Limberg flap the pull is much more transverse, thus bringing skin from the side to aid in closure of the vertical short axis of the rhomboid.

SIMPLIFIED PLANNING IN CHOOSING THE BEST FLAP

In theory, 8 potential Limberg flaps can be designed to close any rhomboidal defect. Which one should we choose? For didactic purposes we will study circular skin defects close to such anatomical landmarks as the ear or the margin of the nose. Following is the step-by-step method.

(1) Draw two parallel lines tangential to the defect and following the *LME* (perpendicular to the *RSTL*). On these lines will fall two sides of the defect parallelogram (Fig. 2A).

(2) Draw the two other sides of the two possible parallelograms by tilting them medially and laterally (angles 60° and 120°) (Fig. 2B, C).

(3) Draw the 4 possible Limberg flaps to close each of the two proposed defects. Note that the umbrella-like designs that complete the Limberg flaps have their central limb following the short axis of the parallelogram (Fig. 2D, E).

(4) Flaps 2, 3, 5, and 8 should not be used,

because they do not follow the LME. Flaps 7 and 8 are not good because their pedicle would attempt to pull on the unyielding ear to close the defect. Only flaps 4 and 6 would be correct to use. Similar reasoning could be applied to the theoretical case in Figure 3.)

The Dufourmentel⁹ flap has not been included in this study, because though it resembles the Limberg flap it draws tissue from an area and in a direction quite similar to that in a straight advancement closure (Fig. 4). We do not use a local flap to cover a skin defect unless we have already discarded the feasibility of straight line closure.

SUMMARY

A technique is presented for designing the 8 possible Limberg flaps to close any given rhomboidal defect. Then we show how to choose out of those 8 the only two that will be correctly oriented so the donor area of the Limberg flap can be closed with a minimal amount of tension.

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